

# NASA TECH BRIEF



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## Electromotive Series Established for Metals Used in Aerospace Technology

An electromotive series (decreasing order of electrode potential) in an aqueous 3 percent sodium chloride solution of pH 6.7 to 7.2 has been experimentally established for approximately 130 metals commonly used in aerospace technology. The potential data (volts) were referred to the half-cell potential of a silver electrode which was given the value zero. For most of the metals, two values of potential (relative to the silver electrode) were obtained. One value ("initial potential") is a non-equilibrium potential obtained from measurements carried out for less than 10 minutes. The other value ("service-related potential") represents an equilibrium or most probable potential which was derived from measurements over a longer time. The initial potentials for most of the metals were generally found to have an average deviation of less than 5 percent. In the case of some alloys, however, the observed initial potentials showed an average deviation of 10 to 20 percent.

The service-related values should be useful in predicting the probability of serious galvanic effect when the corresponding dissimilar metals are coupled in

electrolytes such as seawater. For most pure metals tested, the initial and service-related potentials were reasonably close. Stainless steels and metals that form corrosion products in the electrolyte did not yield consistent and reliable results in all cases. For these, an effective range was estimated for use as a design guide.

### Note:

Complete details, including the experimental procedure and tables of the electromotive series, may be obtained from:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B68-10385

### Patent status:

No patent action is contemplated by NASA.

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